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Data Association and Bullet Tracking Algorithms for the Fight Sight Experiment
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Previous LLNL investigators developed a bullet and projectile tracking system over a decade ago. Renewed interest in the technology has spawned research that culminated in a live-fire experiment, called Fight Sight, in September 2005. The experiment was more complex than previous LLNL bullet tracking experiments in that it included multiple shooters with simultaneous fire, new sensor-shooter geometries, large amounts of optical clutter, and greatly increased sensor-shooter distances.

This presentation describes the data association and tracking algorithms for the Fight Sight experiment. Image processing applied to the imagery yields a sequence of bullet features which are input to a data association routine. The data association routine matches features with existing tracks, or initializes new tracks as needed. A Kalman filter is used to smooth and extrapolate existing tracks. The Kalman filter is also used to back-track bullets to their point of origin, thereby revealing the location of the shooter. It also provides an error ellipse for each shooter, quantifying the uncertainty of shooter location. In addition to describing the data association and tracking algorithms, several examples from the Fight Sight experiment are also presented.

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